BARRY SENDACH
1 561 807 1969 EXT 105
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Structural Calculations for:

Dome D=20 ft
Prepared By:
V.H.

Job Name: Dome D=20 ft

Date: 04/01/2022

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1.0 DESIGN CRITERIA:

1.1 DESIGN CODES & REFERENCES

- 2018 Edition of the International Building Code
- 2018 Edition of the International Residential Code
- ASCE 7-16
- Ultimate Strength Design Handbook (ACI)
- National Design Specification (NDS) ASD Edition

1.2 CODE CRITERIA

2018 IBC

Wind Speed:	95 MPH
Fround Snow load:	60 psf

1.3 MATERIALS

Steel

1.4 STRUCTURAL LOADS

Roof Dead Load	10 psf
Roof Live Load	0 psf

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2. Design

Figure options

Polyhedron: Icosahedron

Frequency, V: 5

Subdivision class: I

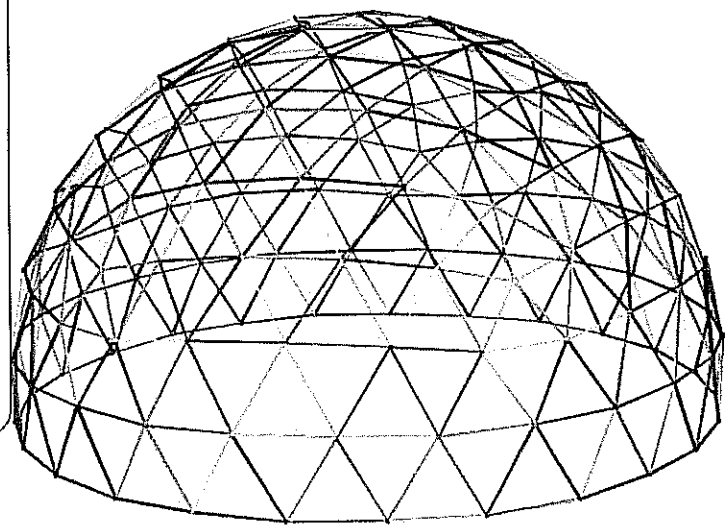
Subdivision method: Equal Chords

Rotational symmetry: Pentad

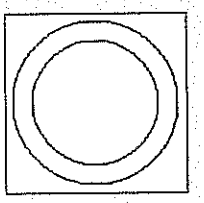
Part of full sphere: 11/20

Resulting ▼

Height from base, m	5.56
Platform radius, m	4.97-4.97
Platform area, m²	76.81
Coverage area, m²	171.97
Sizes (units)	
Faces	8 (275)
Edges	13 (425)
Vertices	5 (151)
Beams 25x2mm	
Total length of beams, m	511.13
Total volume of beams, m³	0.03
Beam length, mm	991-1308
Angle between faces, °	171.54-174.19
Triangles	
Min. height, mm	804-1133
Max. side, mm	1159-1308



Section properties



h =	0.84	(in)	Vy =	0.42	(in)
bf =	0.84	(in)	Vpy =	0.42	(in)
tw =	0.101	(in)	Vz =	0.42	(in)
tf =	0.101	(in)	Vpz =	0.42	(in)
ra =	0	(in)	Ix =	0.032	(in^4)
ri =	0	(in)	Wx =	0.086642	(in^3)
Weight=	0.00085008	(kip/ft)	Iy =	0.016	(in^4)
Wqy =	0.117242	(in^2)			
Ax =	0.234	(in^2)	Iz =	0.016	(in^4)
Wqz =	0.117242	(in^2)			

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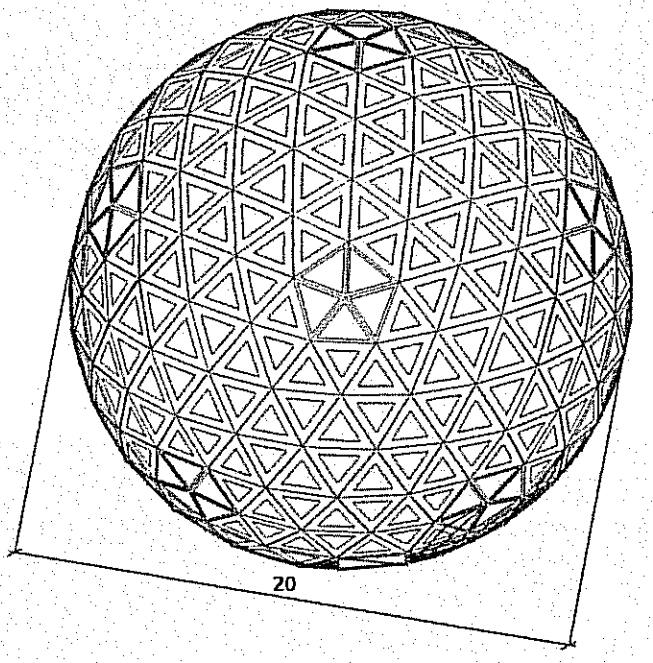
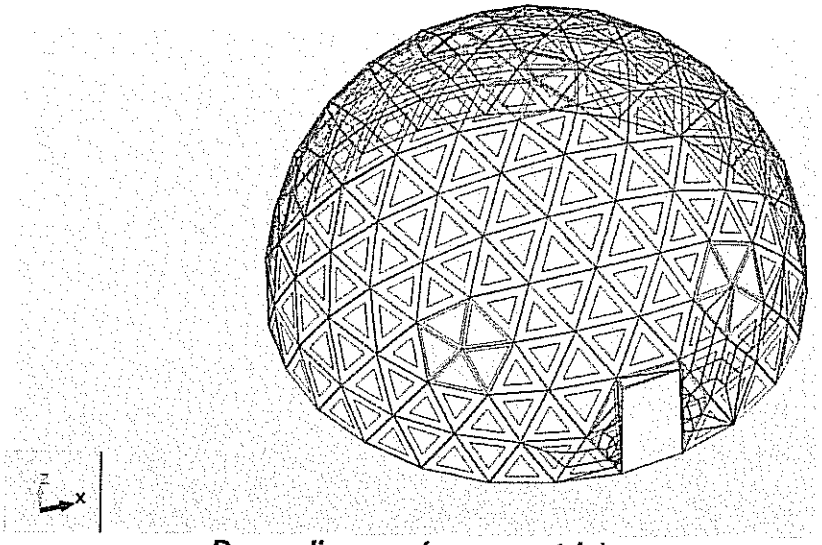


Dome diagram (plan)



Dome diagram (axonometric)

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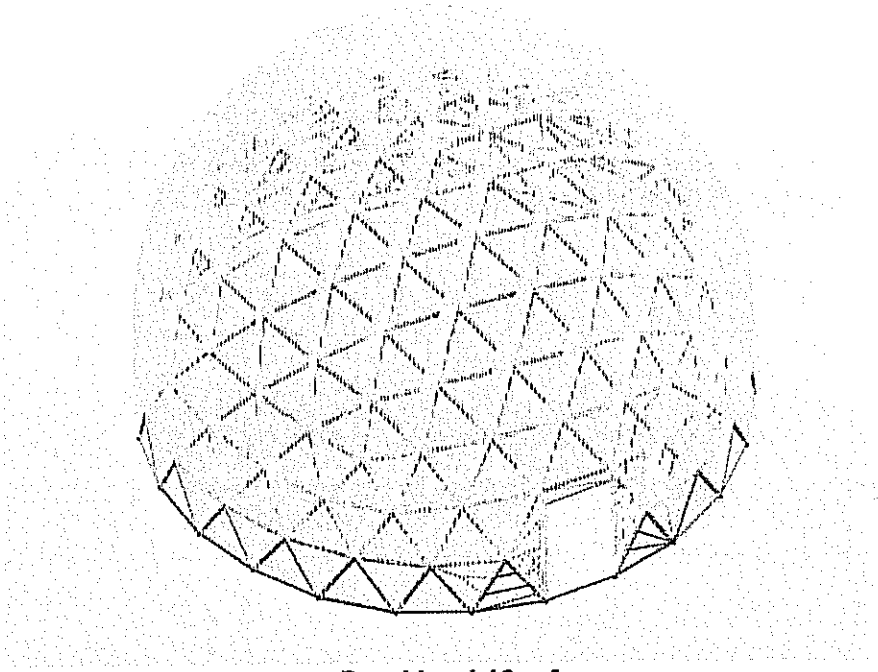
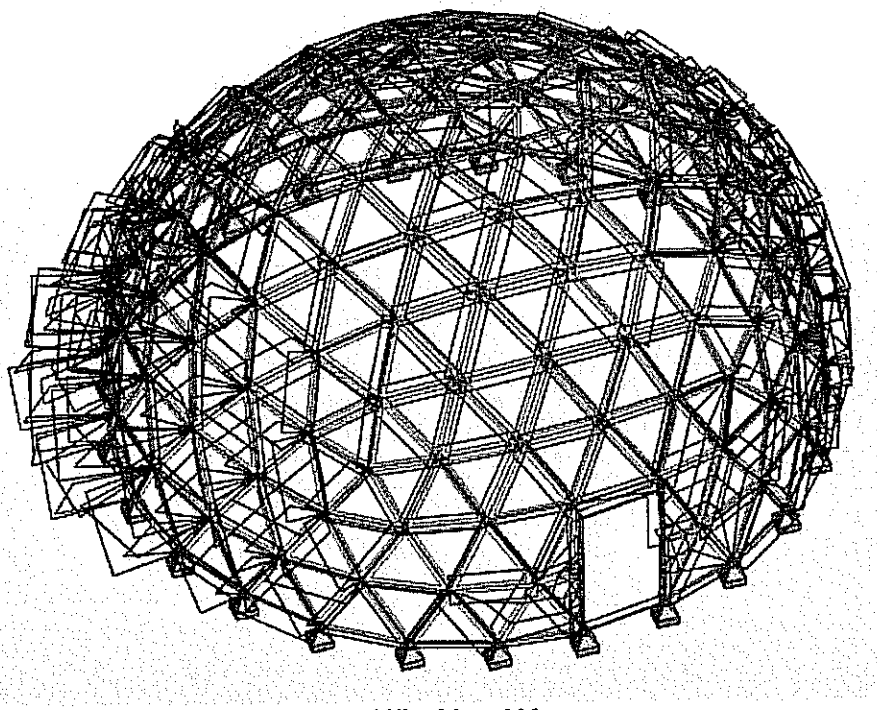


Dead load 10psf



Wind load X

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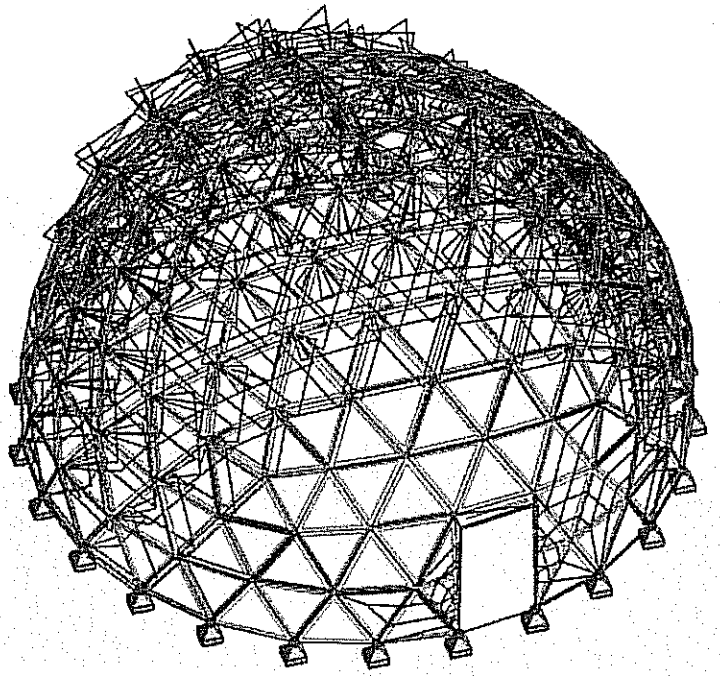
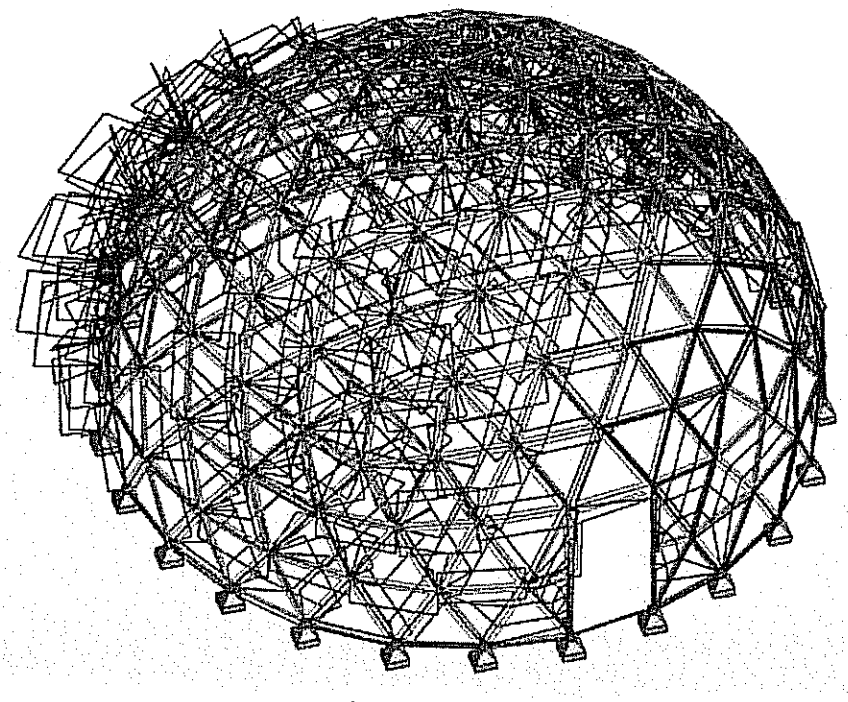


Wind load Y



Wind load XY

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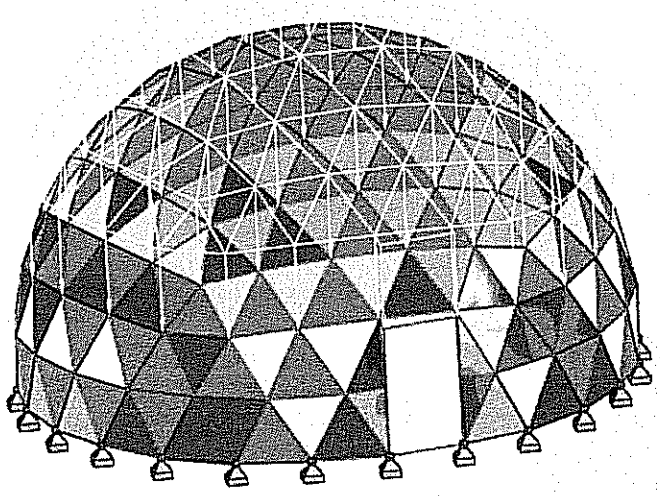
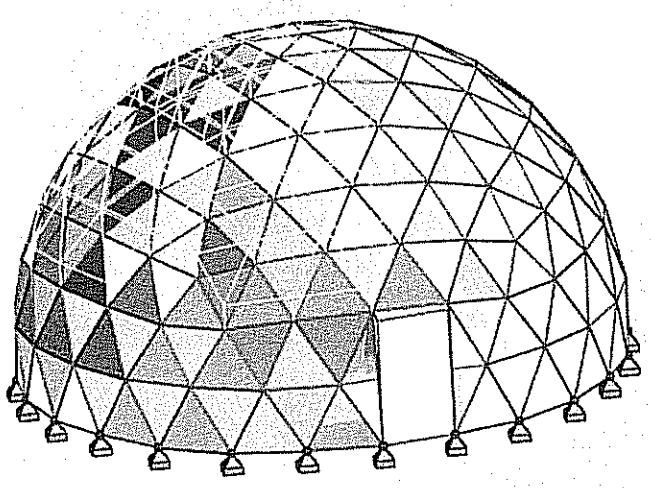


Snow load (V1)



Snow load (V2)

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Results of the calculations

Member	Section	Material	Lay	Laz	Ratio	Case
1	P 0.75	STEEL	132.56	132.56	0.07	11 COMB5
2	P 0.75	STEEL	118.23	118.23	0.06	10 COMB4
3	P 0.75	STEEL	128.98	128.98	0.09	12 COMB6
4	P 0.75	STEEL	121.82	121.82	0.05	12 COMB6
5	P 0.75	STEEL	132.56	132.56	0.58	10 COMB4
6	P 0.75	STEEL	132.56	132.56	0.59	10 COMB4
7	P 0.75	STEEL	128.40	128.40	0.59	12 COMB6
8	P 0.75	STEEL	128.40	128.40	0.59	12 COMB6
9 Simple bar_9	P 0.75	STEEL	78.67	78.67	0.10	10 COMB4
10 Simple bar_10	P 0.75	STEEL	13.33	13.33	0.06	11 COMB5
11 Simple bar_11	P 0.75	STEEL	13.34	13.34	0.06	12 COMB6
12 Simple bar_12	P 0.75	STEEL	71.42	71.42	0.06	6 COMB1
490	P 0.75	STEEL	118.08	118.08	0.24	11 COMB5
491	P 0.75	STEEL	138.25	138.25	0.07	16 COMB7
492	P 0.75	STEEL	118.13	118.13	0.07	14 COMB9
493	P 0.75	STEEL	138.16	138.16	0.26	11 COMB5
494	P 0.75	STEEL	147.47	147.47	0.34	14 COMB9
495	P 0.75	STEEL	134.83	134.83	0.10	6 COMB1
496	P 0.75	STEEL	134.63	134.63	0.32	11 COMB5
497	P 0.75	STEEL	147.50	147.50	0.24	14 COMB9
498	P 0.75	STEEL	138.17	138.17	0.07	6 COMB1
499	P 0.75	STEEL	146.37	146.37	0.11	11 COMB5
500	P 0.75	STEEL	146.20	146.20	0.37	14 COMB9
501	P 0.75	STEEL	146.41	146.41	0.33	10 COMB4
502	P 0.75	STEEL	152.22	152.22	0.33	11 COMB5
503	P 0.75	STEEL	156.06	156.06	0.42	14 COMB9
504	P 0.75	STEEL	152.22	152.22	0.22	6 COMB1
505	P 0.75	STEEL	146.21	146.21	0.31	11 COMB5
506	P 0.75	STEEL	146.21	146.21	0.28	11 COMB5
507	P 0.75	STEEL	146.37	146.37	0.07	3 Wind X+ 161.30 ft/s (f =1.00) Modeling
508	P 0.75	STEEL	138.17	138.17	0.10	8 COMB3
509	P 0.75	STEEL	134.66	134.66	0.26	14 COMB9
510	P 0.75	STEEL	147.70	147.70	0.43	10 COMB4
511	P 0.75	STEEL	152.21	152.21	0.25	11 COMB5
512	P 0.75	STEEL	152.21	152.21	0.37	12 COMB6

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513	P 0.75	STEEL	156.05	156.05	0.35	10 COMB4
514	P 0.75	STEEL	156.05	156.05	0.27	11 COMB5
515	P 0.75	STEEL	152.22	152.22	0.37	12 COMB6
516	P 0.75	STEEL	152.22	152.22	0.11	6 COMB1
517	P 0.75	STEEL	147.49	147.49	0.08	11 COMB5
518	P 0.75	STEEL	134.63	134.63	0.35	12 COMB6
519	P 0.75	STEEL	138.16	138.16	0.08	12 COMB6
520	P 0.75	STEEL	118.22	118.22	0.08	8 COMB3
521	P 0.75	STEEL	118.22	118.22	0.23	12 COMB6
522	P 0.75	STEEL	138.44	138.44	0.39	16 COMB7
523	P 0.75	STEEL	134.64	134.64	0.10	14 COMB9
524	P 0.75	STEEL	138.17	138.17	0.37	12 COMB6
525	P 0.75	STEEL	147.48	147.48	0.39	16 COMB7
526	P 0.75	STEEL	146.21	146.21	0.11	11 COMB5
527	P 0.75	STEEL	146.37	146.37	0.39	12 COMB6
528	P 0.75	STEEL	146.21	146.21	0.33	16 COMB7
529	P 0.75	STEEL	147.49	147.49	0.06	11 COMB5
530	P 0.75	STEEL	138.17	138.17	0.34	12 COMB6
531	P 0.75	STEEL	134.65	134.65	0.11	16 COMB7
532	P 0.75	STEEL	138.26	138.26	0.06	12 COMB6
533	P 0.75	STEEL	118.22	118.22	0.27	12 COMB6
534	P 0.75	STEEL	118.22	118.22	0.07	6 COMB1
535	P 0.75	STEEL	118.22	118.22	0.09	6 COMB1
536	P 0.75	STEEL	138.17	138.17	0.09	10 COMB4
537	P 0.75	STEEL	138.16	138.16	0.28	6 COMB1
538	P 0.75	STEEL	147.48	147.48	0.42	10 COMB4
539	P 0.75	STEEL	134.84	134.84	0.38	16 COMB7
540	P 0.75	STEEL	134.69	134.69	0.09	16 COMB7
541	P 0.75	STEEL	147.42	147.42	0.40	10 COMB4
542	P 0.75	STEEL	146.37	146.37	0.38	6 COMB1
543	P 0.75	STEEL	146.20	146.20	0.56	16 COMB7
544	P 0.75	STEEL	146.41	146.41	0.55	16 COMB7
545	P 0.75	STEEL	152.22	152.22	0.12	16 COMB7
546	P 0.75	STEEL	156.06	156.06	0.63	10 COMB4
547	P 0.75	STEEL	152.22	152.22	0.32	16 COMB7
548	P 0.75	STEEL	146.27	146.27	0.37	14 COMB9
549	P 0.75	STEEL	146.13	146.13	0.50	10 COMB4
550	P 0.75	STEEL	138.17	138.17	0.32	6 COMB1
551	P 0.75	STEEL	3.00	3.00	0.02	15 COMB8
552	P 0.75	STEEL	134.65	134.65	0.35	16 COMB7
553	P 0.75	STEEL	134.41	134.41	0.36	16 COMB7
554	P 0.75	STEEL	147.70	147.70	0.30	16 COMB7
555	P 0.75	STEEL	147.29	147.29	0.31	16 COMB7
556	P 0.75	STEEL	152.21	152.21	0.11	16 COMB7

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557	P 0.75	STEEL	151.73	151.73	0.12	16 COMB7
558	P 0.75	STEEL	152.21	152.21	0.40	16 COMB7
559	P 0.75	STEEL	151.80	151.80	0.41	16 COMB7
560	P 0.75	STEEL	156.05	156.05	0.43	16 COMB7
561	P 0.75	STEEL	156.05	156.05	0.48	14 COMB9
562	P 0.75	STEEL	152.21	152.21	0.63	10 COMB4
563	P 0.75	STEEL	152.22	152.22	0.11	8 COMB3
564	P 0.75	STEEL	147.57	147.57	0.39	14 COMB9
565	P 0.75	STEEL	134.57	134.57	0.44	16 COMB7
566	P 0.75	STEEL	118.22	118.22	0.27	6 COMB1
567	P 0.75	STEEL	118.22	118.22	0.45	16 COMB7
568	P 0.75	STEEL	138.45	138.45	0.27	10 COMB4
569	P 0.75	STEEL	134.64	134.64	0.10	16 COMB7
570	P 0.75	STEEL	134.47	134.47	0.11	16 COMB7
571	P 0.75	STEEL	138.16	138.16	0.53	16 COMB7
572	P 0.75	STEEL	147.48	147.48	0.25	16 COMB7
573	P 0.75	STEEL	147.21	147.21	0.26	16 COMB7
574	P 0.75	STEEL	146.21	146.21	0.42	14 COMB9
575	P 0.75	STEEL	146.37	146.37	0.56	10 COMB4
576	P 0.75	STEEL	146.21	146.21	0.32	16 COMB7
577	P 0.75	STEEL	147.49	147.49	0.37	14 COMB9
578	P 0.75	STEEL	138.17	138.17	0.44	10 COMB4
579	P 0.75	STEEL	134.64	134.64	0.10	8 COMB3
580	P 0.75	STEEL	138.33	138.33	0.12	11 COMB5
581	P 0.75	STEEL	118.13	118.13	0.28	10 COMB4
582	P 0.75	STEEL	138.14	138.14	0.10	10 COMB4
583	P 0.75	STEEL	118.22	118.22	0.23	11 COMB5
584	P 0.75	STEEL	147.36	147.36	0.30	16 COMB7
585	P 0.75	STEEL	134.56	134.56	0.28	11 COMB5
586	P 0.75	STEEL	134.63	134.63	0.31	10 COMB4
587	P 0.75	STEEL	147.50	147.50	0.35	16 COMB7
588	P 0.75	STEEL	138.17	138.17	0.34	11 COMB5
589	P 0.75	STEEL	146.07	146.07	0.38	16 COMB7
590	P 0.75	STEEL	146.14	146.14	0.43	15 COMB8
591	P 0.75	STEEL	152.22	152.22	0.49	10 COMB4
592	P 0.75	STEEL	156.06	156.06	0.40	16 COMB7
593	P 0.75	STEEL	152.22	152.22	0.44	11 COMB5
594	P 0.75	STEEL	146.21	146.21	0.35	12 COMB6
595	P 0.75	STEEL	146.21	146.21	0.38	16 COMB7
596	P 0.75	STEEL	146.37	146.37	0.44	11 COMB5
597	P 0.75	STEEL	134.49	134.49	0.27	6 COMB1
598	P 0.75	STEEL	147.42	147.42	0.45	14 COMB9
599	P 0.75	STEEL	152.21	152.21	0.52	10 COMB4
600	P 0.75	STEEL	152.21	152.21	0.26	6 COMB1

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601	P 0.75	STEEL	156.05	156.05	0.54	15 COMB8
602	P 0.75	STEEL	156.06	156.06	0.47	12 COMB6
603	P 0.75	STEEL	152.22	152.22	0.27	16 COMB7
604	P 0.75	STEEL	152.22	152.22	0.47	15 COMB8
605	P 0.75	STEEL	147.49	147.49	0.29	12 COMB6
606	P 0.75	STEEL	134.63	134.63	0.10	16 COMB7
607	P 0.75	STEEL	138.17	138.17	0.42	11 COMB5
608	P 0.75	STEEL	118.22	118.22	0.25	6 COMB1
609	P 0.75	STEEL	138.17	138.17	0.26	16 COMB7
610	P 0.75	STEEL	134.64	134.64	0.43	16 COMB7
611	P 0.75	STEEL	138.16	138.16	0.33	6 COMB1
612	P 0.75	STEEL	147.48	147.48	0.47	14 COMB9
613	P 0.75	STEEL	146.21	146.21	0.48	12 COMB6
614	P 0.75	STEEL	146.37	146.37	0.26	6 COMB1
615	P 0.75	STEEL	146.21	146.21	0.46	14 COMB9
616	P 0.75	STEEL	147.49	147.49	0.36	12 COMB6
617	P 0.75	STEEL	138.17	138.17	0.21	6 COMB1
618	P 0.75	STEEL	134.65	134.65	0.36	11 COMB5
619	P 0.75	STEEL	138.26	138.26	0.09	12 COMB6
620	P 0.75	STEEL	118.22	118.22	0.08	7 COMB2
621	P 0.75	STEEL	118.22	118.22	0.31	11 COMB5
622	P 0.75	STEEL	138.34	138.34	0.29	12 COMB6
623	P 0.75	STEEL	118.36	118.36	0.27	10 COMB4
624	P 0.75	STEEL	147.55	147.55	0.35	12 COMB6
625	P 0.75	STEEL	134.78	134.78	0.29	10 COMB4
626	P 0.75	STEEL	134.63	134.63	0.29	11 COMB5
627	P 0.75	STEEL	147.50	147.50	0.31	12 COMB6
628	P 0.75	STEEL	138.17	138.17	0.41	10 COMB4
629	P 0.75	STEEL	146.26	146.26	0.26	12 COMB6
630	P 0.75	STEEL	146.34	146.34	0.31	10 COMB4
631	P 0.75	STEEL	152.22	152.22	0.45	11 COMB5
632	P 0.75	STEEL	156.06	156.06	0.29	12 COMB6
633	P 0.75	STEEL	152.22	152.22	0.39	10 COMB4
634	P 0.75	STEEL	146.21	146.21	0.29	11 COMB5
635	P 0.75	STEEL	146.21	146.21	0.12	12 COMB6
636	P 0.75	STEEL	146.36	146.36	0.49	10 COMB4
637	P 0.75	STEEL	134.71	134.71	0.07	8 COMB3
638	P 0.75	STEEL	147.61	147.61	0.29	16 COMB7
639	P 0.75	STEEL	152.21	152.21	0.47	11 COMB5
640	P 0.75	STEEL	152.21	152.21	0.08	8 COMB3
641	P 0.75	STEEL	156.05	156.05	0.38	10 COMB4
642	P 0.75	STEEL	156.05	156.05	0.38	11 COMB5
643	P 0.75	STEEL	152.21	152.21	0.08	8 COMB3
644	P 0.75	STEEL	152.22	152.22	0.47	10 COMB4

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645	P 0.75	STEEL	147.50	147.50	0.08	11 COMB5
646	P 0.75	STEEL	134.64	134.64	0.06	8 COMB3
647	P 0.75	STEEL	138.17	138.17	0.42	10 COMB4
648	P 0.75	STEEL	118.22	118.22	0.08	7 COMB2
649	P 0.75	STEEL	138.37	138.37	0.10	15 COMB8
650	P 0.75	STEEL	134.64	134.64	0.39	11 COMB5
651	P 0.75	STEEL	138.16	138.16	0.10	7 COMB2
652	P 0.75	STEEL	147.48	147.48	0.29	10 COMB4
653	P 0.75	STEEL	146.21	146.21	0.36	11 COMB5
654	P 0.75	STEEL	146.37	146.37	0.07	7 COMB2
655	P 0.75	STEEL	146.21	146.21	0.37	10 COMB4
656	P 0.75	STEEL	147.49	147.49	0.09	11 COMB5
657	P 0.75	STEEL	138.17	138.17	0.05	4 Wind Y- 161.30 ft/s (f =1.00) Modeling
658	P 0.75	STEEL	134.65	134.65	0.42	10 COMB4
659	P 0.75	STEEL	138.26	138.26	0.10	10 COMB4
660	P 0.75	STEEL	118.22	118.22	0.04	4 Wind Y- 161.30 ft/s (f =1.00) Modeling
661	P 0.75	STEEL	118.22	118.22	0.35	10 COMB4
662	P 0.75	STEEL	138.14	138.14	0.08	16 COMB7
663	P 0.75	STEEL	118.14	118.14	0.04	11 COMB5
664	P 0.75	STEEL	147.36	147.36	0.33	10 COMB4
665	P 0.75	STEEL	134.57	134.57	0.03	16 COMB7
666	P 0.75	STEEL	134.63	134.63	0.39	10 COMB4
667	P 0.75	STEEL	147.50	147.50	0.32	10 COMB4
668	P 0.75	STEEL	138.17	138.17	0.06	6 COMB1
669	P 0.75	STEEL	146.07	146.07	0.43	10 COMB4
670	P 0.75	STEEL	146.13	146.13	0.07	11 COMB5
671	P 0.75	STEEL	152.22	152.22	0.39	12 COMB6
672	P 0.75	STEEL	156.06	156.06	0.48	10 COMB4
673	P 0.75	STEEL	152.22	152.22	0.05	7 COMB2
674	P 0.75	STEEL	146.21	146.21	0.46	10 COMB4
675	P 0.75	STEEL	146.21	146.21	0.41	10 COMB4
676	P 0.75	STEEL	146.36	146.36	0.08	6 COMB1
677	P 0.75	STEEL	134.50	134.50	0.38	10 COMB4
678	P 0.75	STEEL	147.42	147.42	0.11	11 COMB5
679	P 0.75	STEEL	152.21	152.21	0.43	12 COMB6
680	P 0.75	STEEL	152.21	152.21	0.53	10 COMB4
681	P 0.75	STEEL	156.05	156.05	0.10	11 COMB5
682	P 0.75	STEEL	156.05	156.05	0.36	12 COMB6
683	P 0.75	STEEL	3.00	3.00	0.02	11 COMB5
684	P 0.75	STEEL	152.22	152.22	0.30	10 COMB4

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685	P 0.75	STEEL	151.93	151.93	0.29	10 COMB4
686	P 0.75	STEEL	152.22	152.22	0.06	6 COMB1
687	P 0.75	STEEL	151.79	151.79	0.06	10 COMB4
688	P 0.75	STEEL	147.50	147.50	0.11	10 COMB4
689	P 0.75	STEEL	147.02	147.02	0.11	10 COMB4
690	P 0.75	STEEL	134.63	134.63	0.24	10 COMB4
691	P 0.75	STEEL	134.25	134.25	0.24	10 COMB4
692	P 0.75	STEEL	138.16	138.16	0.06	6 COMB1
693	P 0.75	STEEL	138.26	138.26	0.24	11 COMB5
694	P 0.75	STEEL	134.59	134.59	0.30	12 COMB6
695	P 0.75	STEEL	147.55	147.55	0.11	11 COMB5
696	P 0.75	STEEL	146.13	146.13	0.34	12 COMB6
697	P 0.75	STEEL	146.27	146.27	0.08	11 COMB5
698	P 0.75	STEEL	147.41	147.41	0.09	10 COMB4
699	P 0.75	STEEL	147.20	147.20	0.09	10 COMB4
700	P 0.75	STEEL	134.69	134.69	0.07	10 COMB4
701	P 0.75	STEEL	134.46	134.46	0.08	10 COMB4
702	P 0.75	STEEL	138.18	138.18	0.07	10 COMB4
703	P 0.75	STEEL	118.23	118.23	0.06	6 COMB1
704	P 0.75	STEEL	138.34	138.34	0.53	10 COMB4
705	P 0.75	STEEL	118.22	118.22	0.22	10 COMB4
706	P 0.75	STEEL	147.55	147.55	0.55	10 COMB4
707	P 0.75	STEEL	134.79	134.79	0.26	10 COMB4
708	P 0.75	STEEL	134.63	134.63	0.08	11 COMB5
709	P 0.75	STEEL	147.50	147.50	0.59	10 COMB4
710	P 0.75	STEEL	138.17	138.17	0.56	10 COMB4
711	P 0.75	STEEL	146.27	146.27	0.48	10 COMB4
712	P 0.75	STEEL	146.34	146.34	0.41	10 COMB4
713	P 0.75	STEEL	152.22	152.22	0.09	11 COMB5
714	P 0.75	STEEL	156.06	156.06	0.61	10 COMB4
715	P 0.75	STEEL	152.22	152.22	0.42	10 COMB4
716	P 0.75	STEEL	146.21	146.21	0.12	10 COMB4
717	P 0.75	STEEL	146.21	146.21	0.58	10 COMB4
718	P 0.75	STEEL	146.37	146.37	0.50	10 COMB4
719	P 0.75	STEEL	134.70	134.70	0.31	10 COMB4
720	P 0.75	STEEL	147.61	147.61	0.48	10 COMB4
721	P 0.75	STEEL	152.21	152.21	0.10	11 COMB5
722	P 0.75	STEEL	152.21	152.21	0.50	10 COMB4
723	P 0.75	STEEL	156.05	156.05	0.55	10 COMB4
724	P 0.75	STEEL	156.05	156.05	0.22	11 COMB5
725	P 0.75	STEEL	152.22	152.22	0.54	10 COMB4
726	P 0.75	STEEL	152.22	152.22	0.47	10 COMB4
727	P 0.75	STEEL	147.49	147.49	0.02	11 COMB5
728	P 0.75	STEEL	118.08	118.08	0.23	10 COMB4

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729	P 0.75	STEEL	138.37	138.37	0.43	10 COMB4
730	P 0.75	STEEL	134.64	134.64	0.10	11 COMB5
731	P 0.75	STEEL	138.16	138.16	0.39	10 COMB4
732	P 0.75	STEEL	147.48	147.48	0.52	10 COMB4
733	P 0.75	STEEL	146.21	146.21	0.23	11 COMB5
734	P 0.75	STEEL	146.37	146.37	0.49	10 COMB4
735	P 0.75	STEEL	146.21	146.21	0.51	10 COMB4
736	P 0.75	STEEL	147.49	147.49	0.02	11 COMB5
737	P 0.75	STEEL	146.07	146.07	0.03	11 COMB5
738	P 0.75	STEEL	146.21	146.21	0.48	11 COMB5
739	P 0.75	STEEL	146.30	146.30	0.54	10 COMB4
740	P 0.75	STEEL	156.06	156.06	0.02	11 COMB5
741	P 0.75	STEEL	152.22	152.22	0.53	10 COMB4
742	P 0.75	STEEL	152.43	152.43	0.55	10 COMB4
743	P 0.75	STEEL	147.49	147.49	0.11	12 COMB6
744	P 0.75	STEEL	134.63	134.63	0.39	10 COMB4
745	P 0.75	STEEL	138.16	138.16	0.44	10 COMB4
746	P 0.75	STEEL	146.13	146.13	0.01	10 COMB4
747	P 0.75	STEEL	146.27	146.27	0.50	10 COMB4
748	P 0.75	STEEL	147.21	147.21	0.12	11 COMB5
749	P 0.75	STEEL	134.48	134.48	0.42	10 COMB4
750	P 0.75	STEEL	137.99	137.99	0.07	12 COMB6
751	P 0.75	STEEL	118.00	118.00	0.28	10 COMB4
752	P 0.75	STEEL	147.49	147.49	0.02	12 COMB6
753	P 0.75	STEEL	147.50	147.50	0.02	12 COMB6
754	P 0.75	STEEL	146.27	146.27	0.23	4 Wind Y- 161.30 ft/s (f =1.00) Modeling
755	P 0.75	STEEL	146.21	146.21	0.63	11 COMB5
756	P 0.75	STEEL	152.22	152.22	0.58	10 COMB4
757	P 0.75	STEEL	156.06	156.06	0.37	4 Wind Y- 161.30 ft/s (f =1.00) Modeling
758	P 0.75	STEEL	152.22	152.22	0.68	11 COMB5
759	P 0.75	STEEL	146.20	146.20	0.40	10 COMB4
760	P 0.75	STEEL	146.21	146.21	0.39	4 Wind Y- 161.30 ft/s (f =1.00) Modeling
761	P 0.75	STEEL	146.37	146.37	0.57	11 COMB5
762	P 0.75	STEEL	134.70	134.70	0.09	12 COMB6
763	P 0.75	STEEL	147.61	147.61	0.48	10 COMB4
764	P 0.75	STEEL	152.21	152.21	0.52	10 COMB4
765	P 0.75	STEEL	152.21	152.21	0.24	4 Wind Y- 161.30 ft/s (f =1.00) Modeling

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766	P 0.75	STEEL	156.05	156.05	0.51	11 COMB5
767	P 0.75	STEEL	156.06	156.06	0.39	10 COMB4
768	P 0.75	STEEL	152.22	152.22	0.32	7 COMB2
769	P 0.75	STEEL	152.22	152.22	0.51	11 COMB5
770	P 0.75	STEEL	147.49	147.49	0.34	11 COMB5
771	P 0.75	STEEL	134.63	134.63	0.31	7 COMB2
772	P 0.75	STEEL	138.16	138.16	0.42	11 COMB5
773	P 0.75	STEEL	138.25	138.25	0.40	10 COMB4
774	P 0.75	STEEL	134.37	134.37	0.34	10 COMB4
775	P 0.75	STEEL	147.36	147.36	0.43	10 COMB4
776	P 0.75	STEEL	145.93	145.93	0.26	10 COMB4
777	P 0.75	STEEL	146.07	146.07	0.33	10 COMB4
778	P 0.75	STEEL	147.21	147.21	0.36	11 COMB5
779	P 0.75	STEEL	134.48	134.48	0.29	11 COMB5
780	P 0.75	STEEL	137.99	137.99	0.37	11 COMB5
781	P 0.75	STEEL	118.08	118.08	0.24	11 COMB5
782	P 0.75	STEEL	146.07	146.07	0.02	11 COMB5
783	P 0.75	STEEL	146.21	146.21	0.66	12 COMB6
784	P 0.75	STEEL	146.30	146.30	0.67	11 COMB5
785	P 0.75	STEEL	156.06	156.06	0.02	11 COMB5
786	P 0.75	STEEL	152.21	152.21	0.69	12 COMB6
787	P 0.75	STEEL	152.43	152.43	0.54	11 COMB5
788	P 0.75	STEEL	147.50	147.50	0.43	7 COMB2
789	P 0.75	STEEL	134.63	134.63	0.39	12 COMB6
790	P 0.75	STEEL	138.17	138.17	0.49	11 COMB5
791	P 0.75	STEEL	146.34	146.34	0.03	12 COMB6
792	P 0.75	STEEL	146.47	146.47	0.31	11 COMB5
793	P 0.75	STEEL	147.40	147.40	0.44	7 COMB2
794	P 0.75	STEEL	134.69	134.69	0.39	11 COMB5
795	P 0.75	STEEL	138.18	138.18	0.31	7 COMB2
796	P 0.75	STEEL	118.00	118.00	0.27	11 COMB5
797	P 0.75	STEEL	118.08	118.08	0.08	10 COMB4
798	P 0.75	STEEL	138.25	138.25	0.21	3 Wind X+ 161.30 ft/s (f =1.00) Modeling
799	P 0.75	STEEL	118.36	118.36	0.09	11 COMB5
800	P 0.75	STEEL	138.16	138.16	0.31	10 COMB4
801	P 0.75	STEEL	147.47	147.47	0.12	12 COMB6
802	P 0.75	STEEL	134.84	134.84	0.33	11 COMB5
803	P 0.75	STEEL	134.63	134.63	0.45	10 COMB4
804	P 0.75	STEEL	147.50	147.50	0.31	3 Wind X+ 161.30 ft/s (f =1.00) Modeling
805	P 0.75	STEEL	138.17	138.17	0.30	11 COMB5

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806	P 0.75	STEEL	146.37	146.37	0.50	10 COMB4
807	P 0.75	STEEL	146.20	146.20	0.08	10 COMB4
808	P 0.75	STEEL	146.41	146.41	0.44	11 COMB5
809	P 0.75	STEEL	152.22	152.22	0.76	10 COMB4
810	P 0.75	STEEL	156.06	156.06	0.02	10 COMB4
811	P 0.75	STEEL	152.22	152.22	0.48	11 COMB5
812	P 0.75	STEEL	146.20	146.20	0.85	10 COMB4
813	P 0.75	STEEL	146.21	146.21	0.02	10 COMB4
814	P 0.75	STEEL	146.36	146.36	0.40	11 COMB5
815	P 0.75	STEEL	138.26	138.26	0.35	11 COMB5
816	P 0.75	STEEL	147.55	147.55	0.39	11 COMB5
817	P 0.75	STEEL	134.79	134.79	0.09	15 COMB8
818	P 0.75	STEEL	134.70	134.70	0.10	12 COMB6
819	P 0.75	STEEL	147.42	147.42	0.35	11 COMB5
820	P 0.75	STEEL	146.27	146.27	0.31	12 COMB6
821	P 0.75	STEEL	146.34	146.34	0.23	15 COMB8
822	P 0.75	STEEL	152.21	152.21	0.13	11 COMB5
823	P 0.75	STEEL	156.06	156.06	0.12	10 COMB4
824	P 0.75	STEEL	152.22	152.22	0.42	10 COMB4
825	P 0.75	STEEL	146.28	146.28	0.09	12 COMB6
826	P 0.75	STEEL	146.13	146.13	0.52	12 COMB6
827	P 0.75	STEEL	134.70	134.70	0.23	12 COMB6
828	P 0.75	STEEL	147.61	147.61	0.33	11 COMB5
829	P 0.75	STEEL	152.21	152.21	0.24	12 COMB6
834	P 0.75	STEEL	152.22	152.22	0.10	6 COMB1
835	P 0.75	STEEL	147.57	147.57	0.05	10 COMB4
836	P 0.75	STEEL	118.22	118.22	0.13	12 COMB6
837	P 0.75	STEEL	138.37	138.37	0.47	12 COMB6
838	P 0.75	STEEL	134.64	134.64	0.25	12 COMB6
839	P 0.75	STEEL	138.16	138.16	0.46	12 COMB6
840	P 0.75	STEEL	147.48	147.48	0.12	10 COMB4
842	P 0.75	STEEL	146.37	146.37	0.11	10 COMB4
844	P 0.75	STEEL	147.49	147.49	0.04	10 COMB4
845	P 0.75	STEEL	138.26	138.26	0.10	12 COMB6
846	P 0.75	STEEL	147.55	147.55	0.11	10 COMB4
847	P 0.75	STEEL	134.79	134.79	0.59	10 COMB4
848	P 0.75	STEEL	134.70	134.70	0.29	10 COMB4
849	P 0.75	STEEL	147.42	147.42	0.17	10 COMB4
850	P 0.75	STEEL	146.27	146.27	0.02	10 COMB4
851	P 0.75	STEEL	146.34	146.34	0.61	10 COMB4
852	P 0.75	STEEL	152.22	152.22	0.45	10 COMB4
853	P 0.75	STEEL	156.06	156.06	0.01	12 COMB6
854	P 0.75	STEEL	152.22	152.22	0.58	10 COMB4
855	P 0.75	STEEL	146.27	146.27	0.39	11 COMB5

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856	P 0.75	STEEL	146.13	146.13	0.02	11 COMB5
857	P 0.75	STEEL	138.26	138.26	0.36	16 COMB7
858	P 0.75	STEEL	147.55	147.55	0.67	10 COMB4
859	P 0.75	STEEL	134.79	134.79	0.33	6 COMB1
860	P 0.75	STEEL	134.69	134.69	0.26	10 COMB4
861	P 0.75	STEEL	147.42	147.42	0.60	16 COMB7
862	P 0.75	STEEL	146.27	146.27	0.90	10 COMB4
863	P 0.75	STEEL	146.34	146.34	0.44	6 COMB1
864	P 0.75	STEEL	152.22	152.22	0.31	10 COMB4
865	P 0.75	STEEL	156.06	156.06	0.85	10 COMB4
866	P 0.75	STEEL	152.22	152.22	0.52	6 COMB1
867	P 0.75	STEEL	146.27	146.27	0.50	10 COMB4
868	P 0.75	STEEL	146.13	146.13	0.66	16 COMB7
869	P 0.75	STEEL	147.47	147.47	0.02	12 COMB6
870	P 0.75	STEEL	152.15	152.15	0.24	11 COMB5
871	P 0.75	STEEL	152.29	152.29	0.86	10 COMB4
872	P 0.75	STEEL	156.05	156.05	0.65	6 COMB1
873	P 0.75	STEEL	156.06	156.06	0.57	10 COMB4
874	P 0.75	STEEL	152.22	152.22	0.76	10 COMB4
875	P 0.75	STEEL	152.22	152.22	0.59	6 COMB1
876	P 0.75	STEEL	147.56	147.56	0.61	16 COMB7
877	P 0.75	STEEL	134.57	134.57	0.50	10 COMB4
878	P 0.75	STEEL	147.48	147.48	0.02	12 COMB6
879	P 0.75	STEEL	146.14	146.14	0.48	10 COMB4
880	P 0.75	STEEL	146.44	146.44	0.73	12 COMB6
881	P 0.75	STEEL	146.21	146.21	0.63	6 COMB1
882	P 0.75	STEEL	147.49	147.49	0.61	10 COMB4
883	P 0.75	STEEL	138.17	138.17	0.53	10 COMB4
884	P 0.75	STEEL	134.64	134.64	0.49	6 COMB1
885	P 0.75	STEEL	138.33	138.33	0.54	16 COMB7
886	P 0.75	STEEL	118.13	118.13	0.35	10 COMB4
887	P 0.75	STEEL	146.23	146.23	0.85	10 COMB4
888	P 0.75	STEEL	146.21	146.21	0.70	12 COMB6
889	P 0.75	STEEL	146.14	146.14	0.03	15 COMB8
890	P 0.75	STEEL	138.17	138.17	0.60	10 COMB4
891	P 0.75	STEEL	134.65	134.65	0.49	12 COMB6
892	P 0.75	STEEL	147.69	147.69	0.50	6 COMB1
893	P 0.75	STEEL	152.21	152.21	0.86	10 COMB4
894	P 0.75	STEEL	152.21	152.21	0.81	12 COMB6
895	P 0.75	STEEL	156.05	156.05	0.02	11 COMB5
896	P 0.75	STEEL	118.22	118.22	0.37	16 COMB7
897	P 0.75	STEEL	138.33	138.33	0.40	6 COMB1
898	P 0.75	STEEL	134.37	134.37	0.59	10 COMB4
899	P 0.75	STEEL	147.36	147.36	0.59	6 COMB1

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900	P 0.75	STEEL	145.93	145.93	0.65	10 COMB4
901	P 0.75	STEEL	146.21	146.21	0.02	12 COMB6
902	P 0.75	STEEL	147.49	147.49	0.02	14 COMB9
903	P 0.75	STEEL	147.70	147.70	0.02	12 COMB6
904	P 0.75	STEEL	146.26	146.26	0.42	8 COMB3
905	P 0.75	STEEL	146.21	146.21	0.65	10 COMB4
906	P 0.75	STEEL	152.22	152.22	0.76	11 COMB5
907	P 0.75	STEEL	156.06	156.06	0.55	8 COMB3
908	P 0.75	STEEL	152.22	152.22	0.83	10 COMB4
909	P 0.75	STEEL	146.41	146.41	0.67	11 COMB5
910	P 0.75	STEEL	146.13	146.13	0.48	8 COMB3
911	P 0.75	STEEL	134.71	134.71	0.28	7 COMB2
912	P 0.75	STEEL	147.61	147.61	0.51	12 COMB6
913	P 0.75	STEEL	152.21	152.21	0.57	11 COMB5
914	P 0.75	STEEL	152.21	152.21	0.41	8 COMB3
915	P 0.75	STEEL	156.05	156.05	0.61	12 COMB6
916	P 0.75	STEEL	156.06	156.06	0.57	12 COMB6
917	P 0.75	STEEL	152.22	152.22	0.45	8 COMB3
918	P 0.75	STEEL	152.22	152.22	0.63	10 COMB4
919	P 0.75	STEEL	147.56	147.56	0.59	12 COMB6
920	P 0.75	STEEL	134.57	134.57	0.37	6 COMB1
921	P 0.75	STEEL	138.25	138.25	0.33	11 COMB5
922	P 0.75	STEEL	134.37	134.37	0.33	11 COMB5
923	P 0.75	STEEL	147.36	147.36	0.41	12 COMB6
924	P 0.75	STEEL	145.93	145.93	0.47	12 COMB6
925	P 0.75	STEEL	146.07	146.07	0.49	14 COMB9
926	P 0.75	STEEL	147.21	147.21	0.51	12 COMB6
927	P 0.75	STEEL	134.48	134.48	0.41	16 COMB7
928	P 0.75	STEEL	138.06	138.06	0.41	10 COMB4
929	P 0.75	STEEL	147.49	147.49	0.02	12 COMB6
938 Simple bar_938	P 0.75	STEEL	26.95	26.95	0.13	6 COMB1
1227 Simple bar_1227	P 0.75	STEEL	29.63	29.63	0.09	11 COMB5

ELEMENTS ARE SECURE.

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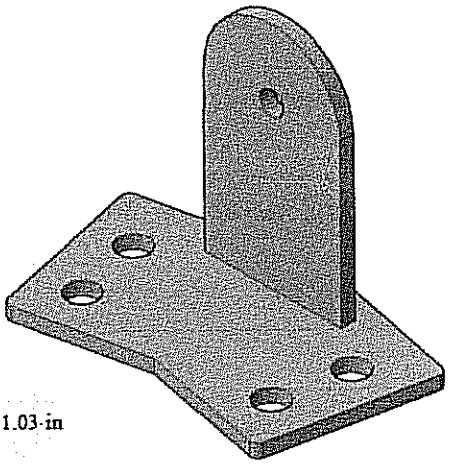
Base Bracket Review:



Geometry

Bracket thickness: $t_{br} := 0.375in$

Bracket width: $b_{br} := 2.5in$

Vertical offset from bolt to base: $e_{base} := 3in$

Bolt diameter: $d_{bolt} = 0.75 \cdot in$

Bolt hole edge distance: $e_{hole} := 1.25in - \frac{0.438in}{2} = 1.03 \cdot in$

Applied Loads

Maximum base uplift $P_{up} := Uplift_{Max} = 1275.00\,lbf$

Maximum downforce reaction: $P_{down} := Downforce_{max} = 1910\,lbf$

Maximum strong axis shear: $V_{max.y} := 1500lbf$

Maximum weak axis shear: $V_{max.z} := 306lbf$

Maximum plate flexure - Z: $M_{pl.z} := V_{max.y} \cdot e_{base} = 4.50 \cdot kip \cdot in$

Maximum plate flexure - Y: $M_{pl.y} := V_{max.z} \cdot e_{base} = 0.92 \cdot kip \cdot in$

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Base Bracket Capacity Calculations

Connection Calculations

Bolt bearing capacity:

$$Brg_{pl.1} := \frac{t_{br} \cdot F_{u.A36} \cdot 2.4 \cdot d_{bolt}}{\Omega_{r.AISC}} = 19.57 \cdot kip$$

Bolt bearing capacity at edge:

$$Brg_{pl.2} := \frac{t_{br} \cdot F_{u.A36} \cdot \min(2.4 \cdot d_{bolt}, 1.2 \cdot e_{hole})}{\Omega_{r.AISC}} = 13.45 \cdot kip$$

Tension Capacity

Plate tension capacity:

$$T_{a\_pl} := \min\left[\frac{t_{br} \cdot b_{br} \cdot F_{y.A36}}{\Omega_{y.AISC}}, \frac{t_{br} \cdot \left(b_{br} - d_{bolt} - \frac{2}{16}in\right) \cdot F_{u.A36}}{\Omega_{r.AISC}}\right] = 17.67 \cdot kip$$

Compression Capacity

Plate compression capacity:

$$r_{y\_pl} := \frac{t_{br}}{\sqrt{12}} = 0.11 \cdot in$$

Elastic buckling stress:

$$F_{e\_pl} := \frac{\pi^2 \cdot E_s}{\left(\frac{e_{base}}{r_{y\_pl}}\right)^2} = 372.68 \cdot ksi \qquad \frac{F_{y.A36}}{F_{e\_pl}} = 0.10$$

Critical stress:

$$F_{cr\_pl} := 0.658^{\frac{F_{y.A36}}{F_{e\_pl}}} \cdot F_{y.A36} = 34.57 \cdot ksi$$

Plate compression capacity:

$$P_{a\_pl} := \frac{F_{cr\_pl} \cdot t_{br} \cdot b_{br}}{\Omega_{y.AISC}} = 19.41 \cdot kip$$

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Bending Capacity

Plate section modulus - Z: $Z_{x\_pl.z} := \frac{1}{4} b_{br}^{2} \cdot t_{br} = 0.586 \cdot in^3$

Plate flexural capacity - Z: $M_{ax\_pl.z} := \frac{Z_{x\_pl.z} \cdot F_{y.A36}}{\Omega_{y.AISC}} = 1.05\,ft \cdot kip$

$F_{y.A36} = 36000.00\,psi$

Plate section modulus - Y: $Z_{x\_pl.y} := \frac{1}{4} b_{br} \cdot t_{br}^{2} = 0.088 \cdot in^3$

Plate flexural capacity - Y: $M_{ax\_pl.y} := \frac{Z_{x\_pl.y} \cdot F_{y.A36}}{\Omega_{y.AISC}} = 0.16\,ft \cdot kip$

Shear Capacity

Shear capacity: $V_{a\_pl} := \frac{F_{y.A36} \cdot 0.6 \cdot t_{br} \cdot b_{br}}{\Omega_{y.AISC}} = 12.13 \cdot kip$

Connection strength ratio: $Ratio_{conn.pl} := \frac{\sqrt{P_{up}^{2} + V_{max.z}^{2}}}{Brg_{pl.2}} = 0.10 \quad < 1.0 \quad OK$

Combined flexure and axial strength ratio: $Ratio_{pl.1} := \frac{1}{2} \cdot \max\left(\frac{P_{up}}{T_{a\_pl}}, \frac{P_{down}}{P_{a\_pl}}\right) + \frac{M_{pl.z}}{M_{ax\_pl.z}} + \frac{M_{pl.y}}{M_{ax\_pl.y}} = 0.89 \quad < 1.0 \quad OK$

Shear strength ratio: $Ratio_{pl.2} := \frac{\max(V_{max.y}, V_{max.z})}{V_{a\_pl}} = 0.12 \quad < 1.0 \quad OK$

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Tension Weld

Thickness of Base Metal: $t_{base} := 0.375in$

Weld Thickness: $t_{weld} := 0.375in$

Weld Throat: $t_{weld.throat} := \frac{\sqrt{2}}{2} \cdot t_{weld} = 0.27 \cdot in$

Allow. Weld Strength (per inch): $R_{a.weld.e70wr} := \frac{t_{weld.throat} \cdot F_{weld.steel} \cdot 0.85}{\Omega_{r.AISC}} = 4.73 \cdot \frac{kip}{in}$

Shear Per Base Metal: $R_{a.weld.base.shear.wr} := \frac{t_{weld} \cdot F_{u.A36} \cdot 0.6}{\Omega_{r.AISC}} = 6.52 \cdot \frac{kip}{in}$

Minimum Governing Weld Strength: $R_{a.weld.wr} := \min(R_{a.weld.e70wr}, R_{a.weld.base.shear.wr}) = 4.73 \cdot \frac{kip}{in}$

Width of connection member: $B_b := b_{br} = 2.50 \cdot in$

Height of connecting member: $H_b := t_{br} = 0.38 \cdot in$

Total length of weld: $L_{weld} := 2 \cdot B_b + 2 \cdot H_b = 5.75 \cdot in$

Weld strength: $P_{a.weld.wrm} := R_{a.weld.wr} \cdot L_{weld}$ $P_{a.weld.wrm} = 27215.88\,lbf$

Total tension: $P_{up} = 1275.00\,lbf$

Utilization: $util_{weld.wrm} := \frac{P_{up}}{P_{a.weld.wrm}}$ $util_{weld.wrm} = 0.05$

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Maximum Loads (Per Risa):

Axial Tension: $A_a := 1276lbf$

Y Shear: $V_y := V_{max.y} = 1500.00\,lbf$

Z Shear: $V_z := V_{max.z} = 306.00\,lbf$

Torsion: $T_x := 36lbf \cdot ft$

Y Axis Moment: $M_y := 0.070kip \cdot ft = 0.84 \cdot kip \cdot in$

Z Axis Moment: $M_z := 0.673kip \cdot ft = 8.08 \cdot kip \cdot in$

Connection Properties

Width of connection member: $B_b = 2.50 \cdot in$

Height of connecting member: $H_b = 0.38 \cdot in$

Note: Weld will be treated as 1/8" all around weld. Reference allowable weld strength properties from previous sheets.

Weld Design

Section Modulus Z: $S_{weld.z} := B_b \cdot H_b + \frac{B_b^2}{3} = 3.02 \cdot in^2$

Section Modulus Y: $S_{weld.y} := B_b \cdot H_b + \frac{H_b^2}{3} = 0.98 \cdot in^2$

Length of Weld: $L_{weld} = 5.75 \cdot in$

Vertical Y Shear Length: $L_{weld.y} := 2 \cdot H_b = 0.75 \cdot in$

Horizontal Z Shear Length: $L_{weld.z} := 2 \cdot B_b = 5.00 \cdot in$

Area Bounded by centerline: $A_{tors} := B_b \cdot H_b = 0.94 \cdot in^2$

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Axial Stress: $f_a := \frac{A_a}{L_{weld}} = 0.22 \cdot \frac{kip}{in}$

Shear Stress Y: $f_{v.y} := \frac{V_y}{L_{weld.y}} = 2.00 \cdot \frac{kip}{in}$

Shear Stress Z: $f_{v.z} := \frac{V_z}{L_{weld.z}} = 0.06 \cdot \frac{kip}{in}$

Torsional Shear Stress: $f_{v.t} := \frac{T_x}{2 \cdot A_{tors}} = 0.23 \cdot \frac{kip}{in}$

Bending Stress Y: $f_{b.y} := \frac{M_y}{S_{weld.y}} = 0.85 \cdot \frac{kip}{in}$

Bending Stress Z: $f_{b.z} := \frac{M_z}{S_{weld.z}} = 2.67 \cdot \frac{kip}{in}$

Max weld stress: $f_{weld.peak} := \sqrt{(f_a + f_{b.y} + f_{b.z})^2 + f_{v.y}^2 + (f_{v.z} + f_{v.t})^2} = 4.26 \cdot \frac{kip}{in}$

Allowable weld stress: $F_{weld.all} := R_{a.weld.wr} = 4.73 \cdot \frac{kip}{in}$

$check_{F.weld.all} := \begin{cases} \text{"OK"} & \text{if } F_{weld.all} \geq f_{weld.peak} \\ \text{"NO GOOD"} & \text{otherwise} \end{cases} = \text{"OK"}$

Utilization %: $util\%_{weld} := \frac{f_{weld.peak}}{F_{weld.all}} = 89.98 \cdot \%$ $util\%_{weld} = 0.90$

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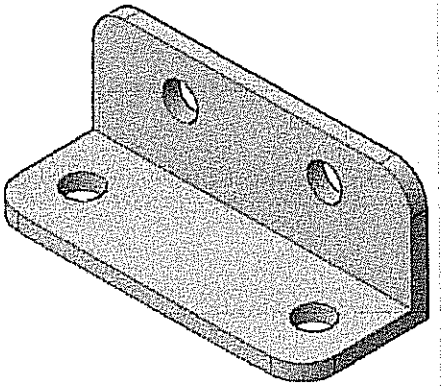
Door frame base bracket:



Maximum uplift: $T_{br.door} := 955lbf$

Maximum shear: $V_{br.door} := 430lbf$

Bracket thickness: $t_{br} := 0.25in$

Bracket length: $L_{br} := 5in$

Lag bolt diameter: $d_{bolt} := 0.5in$

Lag bolt hole edge distance: $e_{hole} := \frac{11}{16}in - \frac{9}{32}in = 0.41 \cdot in$

Distance from base hole to vert leg: $b' := 0.72in$

Tributary length: $p_{br} := \min\left(1in \cdot 1.75 + \frac{11}{16}in, \frac{L_{br}}{2}\right) = 2.44 \cdot in$

Prying capacity: $T_{a\_pry} := 2 \cdot \frac{t_{br}^2 \cdot p_{br} \cdot F_{u.A36}}{\Omega_{y.AISC} \cdot 4 \cdot b'} = 3.67 \cdot kip$

Shear capacity: $V_{a\_br} := \frac{F_{y.A36} \cdot 0.6 \cdot L_{br} \cdot t_{br}}{\Omega_{y.AISC}} = 16.17 \cdot kip$

Bolt bearing capacity: $Brg_{pl.3} := 2 \cdot \frac{t_{br} \cdot F_{u.A36} \cdot \min(2.4 \cdot d_{bolt}, 1.2 \cdot e_{hole})}{\Omega_{r.AISC}} = 7.07 \cdot kip$

Lag bolt shear capacity: $V_{a\_lag\_parallel} := 2 \cdot 500lbf \cdot 1.15 = 1150lbf$

$V_{a\_lag\_perp} := 2 \cdot 310lbf \cdot 1.15 = 713lbf$

Prying strength ratio: $Ratio_{prying} := \frac{V_{br.door}}{T_{a\_pry}} = 0.12$ < 1.0 OK

Uplift strength ratio: $Ratio_{up} := \frac{T_{br.door}}{\min(T_{a\_pry}, Brg_{pl.3}, V_{a\_lag\_parallel})} = 0.83$ < 1.0 OK

Shear strength ratio: $Ratio_{shear} := \frac{V_{br.door}}{\min(V_{a\_br}, Brg_{pl.3}, V_{a\_lag\_perp})} = 0.60$ < 1.0 OK

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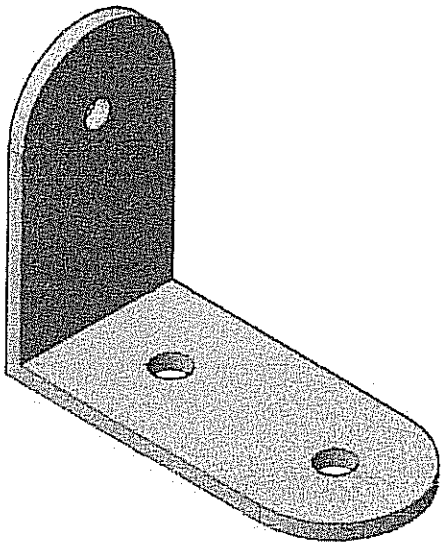
Door frame side and top bracket:



Max loads parallel to tab axis:

$T_{tab.1} := 550lbf$ $P_{tab.1} := 500lbf$

Max loads perpendicular to tab axis (in plane of tab):

$P_{tab.2} := 780lbf$

Max loads perpendicular to tab axis (out of tab plane):

$P_{tab.3} := 632lbf$

Bracket thickness: $t_{br} := 0.25in$

Bracket width: $b_{br} := 2.5in$

Vertical offset from bolt to base: $e_{base} := 3in - t_{br} = 2.75 \cdot in$

Horizontal offset from bottom bolt to vertical tab: $e_{vertical} := 4.25in$

Width of bent plate: $b_{bent} := 2.5in$

Tickness of bent plate: $d_{bent} := \frac{3}{16}in$

Bolt diameter: $d_{bolt} := 0.75in$

Bolt hole edge distance: $e_{hole} := 1.25in - \frac{0.438in}{2} = 1.03 \cdot in$

Plate tension capacity: $T_{a\_pl} := \min\left[\frac{t_{br} \cdot b_{br} \cdot F_{y\_A36}}{\Omega_{y\_AISC}}, \frac{t_{br}\left(b_{br} - d_{bolt} - \frac{2}{16}in\right) \cdot F_{u\_A36}}{\Omega_{r\_AISC}}\right] = 11.78 \cdot kip$

Distance from base hole to vert leg: $b' := 1.09in$

Tributary length: $p_{br} := \min(1.375in \cdot 3.5, b_{br}) = 2.50 \cdot in$

Prying capacity: $T_{a\_pry} := \frac{t_{br}^2 \cdot p_{br} \cdot F_{u\_A36}}{\Omega_{y\_AISC} \cdot 4 \cdot b'} = 1.24 \cdot kip$

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Plate compression capacity: $r_{y\_pl} := \frac{t_{br}}{\sqrt{12}} = 0.07 \cdot in$

Elastic buckling stress: $F_{e\_pl} := \frac{\pi^2 \cdot E_s}{\left(\frac{e_{base}}{r_{y\_pl}}\right)^2} = 197.12 \cdot ksi$ $\frac{F_{y.A36}}{F_{e\_pl}} = 0.18$

Critical stress: $F_{cr\_pl} := 0.658^{\frac{F_{y.A36}}{F_{e\_pl}}} \cdot F_{y.A36} = 33.35 \cdot ksi$

$P_{a\_pl} := \frac{F_{cr\_pl} \cdot t_{br} \cdot b_{br}}{\Omega_{y.AISC}} = 12.48 \cdot kip$

Bolt bearing capacity: $Brg_{pl.1} := \frac{t_{br} \cdot F_{u.A36} \cdot 2.4 \cdot d_{bolt}}{\Omega_{r.AISC}} = 13.05 \cdot kip$

Bolt bearing capacity at edge: $Brg_{pl.2} := \frac{t_{br} \cdot F_{u.A36} \cdot \min(2.4 \cdot d_{bolt}, 1.2 \cdot e_{hole})}{\Omega_{r.AISC}} = 8.97 \cdot kip$

Plate section modulus: $Z_{x\_pl} := \frac{1}{4} \cdot b_{br}^2 \cdot t_{br} = 0.39 \cdot in^3$ $Z_{y\_pl} := \frac{1}{4} \cdot b_{br} \cdot t_{br}^2 = 0.039 \cdot in^3$

Plate flexural capacity: $M_{ax\_pl} := \frac{Z_{x\_pl} \cdot F_{y.A36}}{\Omega_{y.AISC}} = 8.42 \cdot kip \cdot in$

$M_{ay\_pl} := \frac{Z_{y\_pl} \cdot F_{y.A36}}{\Omega_{y.AISC}} = 0.84 \cdot kip \cdot in$

Maximum plate flexure: $M_{pl} := Shear_{Max} \cdot e_{base} = 4.19 \cdot kip \cdot in$

Shear capacity: $V_{a\_pl} := \frac{F_{y.A36} \cdot 0.6 \cdot t_{br} \cdot b_{br}}{\Omega_{y.AISC}} = 8.08 \cdot kip$

Lag bolt shear capacity: $V_{a\_lag\_parallel} = 1150 lbf$ $V_{a\_lag\_perp} = 713 lbf$

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Lag bolt tension capacity:

$$T_{a\_lag} := 334\frac{lbf}{in}\cdot 2.5in\cdot 1.6 = 1336lbf$$

Compression capacity parallel to tab:

$$P_{a\_br} := \min(P_{a\_pl}, Brg_{pl.1}) = 12.48\cdot kip$$

Tension capacity parallel to tab:

$$T_{a\_br} := \min(T_{a\_pl}, Brg_{pl.2}, T_{a\_pry}, T_{a\_lag}) = 1.24\cdot kip$$

Compression strength ratio:

$$Ratio_{P\_br} := \frac{P_{tab.1}}{P_{a\_br}} = 0.04 \quad < 1.0 \quad \underline{OK}$$

Tension strength ratio:

$$Ratio_{T\_br} := \frac{T_{tab.1}}{T_{a\_br}} = 0.44 \quad < 1.0 \quad \underline{OK}$$

Capacity perpendicular to tab (in plane of tab):

$$P_{a\_br\_perp.2} := \min\left(Brg_{pl.2}, \frac{M_{ax\_pl}}{e_{base}}, \frac{2\cdot T_{a\_lag}\cdot b_{br}\cdot 0.5}{e_{base}} + P_{tab.1}\right) = 1715lbf$$

Compression is added to tensile capacity because for controlling load case, plate is in compression thus able to aid in resolving bending.

Strength ratio perpendicular to tab (in plane of tab):

$$Ratio_{br\_perp.2} := \frac{P_{tab.2}}{P_{a\_br\_perp.2}} = 0.45 \quad < 1.0 \quad \underline{OK}$$

Capacity perpendicular to tab (perpendicular to plane of tab):

$$P_{a\_br\_perp.3} := \min\left(\frac{2M_{ay\_pl}}{0.75in}, \frac{T_{a\_lag}\cdot 4in}{e_{base}} + P_{tab.1}\right) = 2246lbf$$

Moment capacity of plate doubled because, with bent plate installed, the load is sharede between 2 cantilevered plates

Strength ratio perpendicular to tab (perpendicular to plane of tab):

$$Ratio_{br\_perp.3} := \frac{P_{tab.3}}{P_{a\_br\_perp.3}} = 0.28 \quad < 1.0 \quad \underline{OK}$$

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Length of bent plate

$$L_{bent} := \sqrt{(e_{base} - 0.75in)^2 + (e_{vertical} - 0.75in)^2} = 4.03 \cdot in$$

Moment of inertia of bent plate

$$I := \frac{\left(b_{bent} \cdot d_{bent}^{3}\right)}{12}$$

Cross section area of bent

$$A_{bent} := b_{bent} \cdot d_{bent} = 0.00\,ft^{2.00}$$

Radius of giration

$$r := \sqrt{\frac{I}{A_{bent}}} = 0.05 \cdot in$$

Elastic buckling stress

$$F_{e\_bent} := \frac{\left(\pi^2 \cdot E_s\right)}{\left(\frac{L_{bent}}{r}\right)^2} = 51.60 \cdot ksi$$

Critical stress

$$F_{cr\_bent} := \begin{cases} \left[\left(0.658^{\frac{F_y}{F_{e\_bent}}}\right) \cdot F_y\right] & \text{if } \frac{F_y}{F_{e\_bent}} \le 2.25 \\ (0.877 \cdot F_e) & \text{if } \frac{F_y}{F_{e\_bent}} > 2.25 \end{cases} \qquad F_{cr\_bent} = 28.92 \cdot ksi$$

Nominal compressive stress

$$P_{n\_bent} := F_{cr\_bent} \cdot A_{bent} = 13554.90\,lbf$$

Strength ratio of bent plate

$$Ratio_{bent} := \frac{\left[P_{tab.3} \cdot \left(\frac{L_{bent}}{e_{vertical} - 0.75in}\right)\right]}{P_{n\_bent}} = 0.05 \quad < 1.0 \quad \underline{OK}$$

3. Conclusion

ELEMENTS AND CONNECTIONS ARE SECURE.